

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form ([see an example](#)) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

ARTICLE DETAILS

TITLE (PROVISIONAL)	The high cost of diarrheal illness for urban slum households: a cost recovery approach
AUTHORS	Patel, Ronak; Stoklosa, Hanni; Shitole, Shrutika; Shitole, Tejal; Sawant, Kiran; Nanarkar, Mahesh; Subbaraman, Ramnath; Ridpath, Alison; Patil-Deshmuk, Anita

VERSION 1 - REVIEW

REVIEWER	Gagandeep Kang Professor Christian Medical College Vellore, India No competing interests
REVIEW RETURNED	04-Nov-2012

THE STUDY	The research question is regarding the cost of diarrheal illness to a household. The study is done at a time when diarrhoeal illness is likely to be at the highest rates during the year. The reason for just 5 weeks of follow up is not defined. Diarrhoea is not defined, and it is important that there is a clear case definition, even if it is not validated. Insufficient information on age distribution of cases and hospitalization, both of which can affect costs. It would also be useful to provide a better description of where medical and non-medical costs (e.g. private provider, government clinic, etc) are incurred.
RESULTS & CONCLUSIONS	There are data available on costing of diarrhea in several settings in India, although there is limited information on cost of illness in adults. The text in Results repeats the information in the tables.
GENERAL COMMENTS	Good description of the situation regarding water and sanitation issues in a Mumbai slum. It would be good to take this further and provide some estimate of what proportion of India's population lives in similar settings and the estimated shortfalls in water supply (both quantity and quality) and sanitation. Even though the stated intent is to examine whether resources are available to support prevention rather than management, other than monetization of time, no attempt is made to quantify expected costs of water and sanitation infrastructure.

REVIEWER	Richard Rheingans Associate Professor University of Florida, USA I have no competing interests
REVIEW RETURNED	20-Dec-2012

<p>GENERAL COMMENTS</p>	<p>Overall, I think this is a very useful study. However the non-standard definitions and presentation, and over reaching conclusions take away from this. I think these can be addressed, leading to a strong paper.</p> <p>Minor comments</p> <p>P3, line 40, 46. The word haphazard sounds subjective. That isn't necessarily a problem, but may take away from the paper. The system is later referred to elaborate and complex, which seem more fitting.</p> <p>P4; first paragraph. Some repetition with above - # residents, summertime shortages.</p> <p>P4; line 23-4. I agree, but a citation would help.</p> <p>P4; line 27. Referencing 19 studies for this point seems excessive unless there is a need to discuss them in more detail. Some of the citations are repeated (13 and 16). Diarrhea dos not need to be capitalized.</p> <p>P4; line 34. These 19 studies don't directly support this claim. I think the statement is true, but a few well chosen studies focused on the causal relationship between water quantity and quality on diarrhea would be more convincing.</p> <p>P4; line 34-49. This paragraph is a bit wide ranging. The references 32-34 which are used to explain the impact of water access on long-term earnings do not support that. Two of the studies are on helminth infections. Although these are related to poor sanitation, they are not related to water access. The third is a summary paper with out direct empirical evidence of its own. The combination of global estimates and local survey results is distracting.</p> <p>P4; line 56-7. This is a generalization that is not always true. It all depends on the cost and effectiveness of the intervention. Nevertheless, the point is important. High household costs may be an important opportunity to offset the costs of preventive interventions, making them more cost-effective and (perhaps more importantly) more affordable to households. This is an important</p>
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	<p>point because it is central to the significance of the paper (the cost recovery angle).</p> <p>P5; line 3-8. The connection between diarrheal costs and potential offsets for water and sanitation interventions is important, but a bit oversimplified. Not all diarrheal costs are related to water and sanitation (notably rotavirus or foodborne pathogens). Also, water and sanitation interventions do not necessarily eliminate all water borne pathogens. Hopefully this is addressed further below.</p> <p>P5; line 21-3. The use of community members as researchers has important advantages and disadvantage. Advantages include unexpected insights and higher likelihood that survey questions capture what the researchers intend. Potential disadvantages include increased yea-saying from respondents or leading questions. Given that this is fairly innovative in health research, it would be helpful if the authors could mention some of the advantages and disadvantages and how problems were avoided. This isn't essential, but could be a benefit to others.</p> <p>P5; line 31-41. The relationship between the baseline and longitudinal is a bit unclear. Is there an overlap between them? Was different data collected?</p> <p>P5; line 43-5. Additional costs for water and toilet use should be labeled as avoidance costs. These are direct costs, but not direct medical. These are important but should be reported separate from medical costs.</p> <p>P6; line 11-13. Eliminating the outliers may reduce their influence, but it also excludes the more 'catastrophic' events that might push a family over the edge. It also likely underestimates the mean. Reporting the median or distribution might help, otherwise it may be worth mentioning.</p> <p>P6; line 38. Are the 400 households in the longitudinal survey the only ones who had events? Were there any repeat households with more than one event?</p> <p>P6; all. It is sometimes hard to tell what is coming from the baseline and what is coming from the longitudinal data. Please try to clarify.</p>
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	<p>P7; line12. Unclear how the median can range from 300-450. Is this the variation between weeks?</p> <p>P7; line 17-9. This interpretation probably belongs in the discussion.</p> <p>P7; line 22-4. Direct medical costs and non-medical direct costs should be clearly labeled. Transport to providers is typically considered non-medical direct.</p> <p>P7; line 27. How was the cost of household chores not completed calculated? This opportunity cost is very problematic. Some studies have shown that these activities are not forgone, but rather delayed. If a market wage rate was used, this should be explained and justified. The costing of non-wage labor and chores needs to be explained and justified.</p> <p>P7; line 33. Is this just wages or all indirect costs as calculated.</p> <p>P7; line 30-6. The mixture of reported direct and indirect costs together in this paragraph is a bit confusing.</p> <p>P7; line 37-47. This is helpful but seems to belong in the methods. It is always challenging to estimate these opportunity costs, but great care needs to be used in estimating and interpreting them. First, there needs to be some assurance that these activities were actually forgone, not just delayed a few days or done in the evening (in lieu of sleep or leisure). This depends on how the question was asked. If it was forgone, then what was lost was a service (having a clean floor, etc), not a wage. The question is then how much these households would pay someone to complete that task (i.e., the value to them), not how much they would charge to do the task for someone else. The point is there are substantial uncertainties about the estimates of these costs. It is fine to present them, but they should be reported separately from other indirect costs that actually reflect forgone wages and income.</p> <p>P7; line 49-50. The distinction between 'basic direct cost' and 'other direct cost' is not standard within the health economics literature. I would suggest using standard definitions such as direct medical,</p>
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	<p>direct non-medical, and direct avoidance costs.</p> <p>P8; line 13+. Suggest combining table 1 and 2. Suggest more complete titles. Suggest dividing out medical and non-medical expenditures in 'Basic direct costs'.</p> <p>P9; line 5-11. This is a big leap. Although the costs of illness are high compared to income, what portion could be eliminated with improved water and sanitation? What is the cost of improved infrastructure? The average weekly cost per household is much lower than the cost per episode. The introduction makes the argument that user fees for the inefficient water delivery in this community are higher than those in communities with improved water supply. It is likely that user fees for water could easily pay for improved systems, if they were offered. The weekly avoidable diarrheal costs provide an additional potential offset for cost recovery, but it is unclear how that compares.</p> <p>P9; line 16. It would be helpful to explain by what standard is this cost 'high', perhaps by comparing it to income.</p> <p>P9; line 22. "...upfront investment in infrastructure is cost-effective." This isn't using the term cost-effective in a standard way. I don't think the authors develop or justify this conclusion.</p> <p>P9; line 46. This is a completely inappropriate citation. It is on rotavirus (not water-borne). There are a few recognized high quality meta-analyses (e.g. Fewtrell and Colford) that should be cited. 63% reduction is out of line with the published evidence.</p> <p>P9; line 46-50. Confusing.</p> <p>P10; line 6-10. The indirect estimates of non-wage time loss is almost certainly an over estimate for this community, not an underestimate. In communities with higher wages or high women's income, the opportunity cost of labor would be greater, but they may also be more likely to have better water and sanitation infrastructure.</p> <p>P10; line 19. Again, citation 38 is not appropriate in that it is referring to a diarrheal pathogen that is not considered preventable with water</p>
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	<p>and sanitation improvements.</p> <p>P10; line 30. What is the support for community taps providing 25% reduction. Meta-analyses of WASH interventions do not support this.</p> <p>P10; line 45-6. I don't see how the study shows the feasibility of such programs.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer: Gagandeep Kang
Professor
Christian Medical College
Vellore, India

No competing interests

The research question is regarding the cost of diarrheal illness to a household. The study is done at a time when diarrhoeal illness is likely to be at the highest rates during the year. The reason for just 5 weeks of follow up is not defined.

---(Included in methods now)

Diarrhoea is not defined, and it is important that there is a clear case definition, even if it is not validated.

---(Included in methods now)

Insufficient information on age distribution of cases and hospitalization, both of which can affect costs. (Age distribution included in results now but we do not have hospitalization rates)

It would also be useful to provide a better description of where medical and non-medical costs (e.g. private provider, government clinic, etc) are incurred. (Included in results now)

There are data available on costing of diarrhea in several settings in India, although there is limited information on cost of illness in adults.

The text in Results repeats the information in the tables. (We thinned the amount of repetitive information in the results section)

Good description of the situation regarding water and sanitation issues in a Mumbai slum. It would be good to take this further and provide some estimate of what proportion of India's population lives in similar settings and the estimated shortfalls in water supply (both quantity and quality) and sanitation. Even though the stated intent is to examine whether resources are available to support prevention rather than management, other than monetization of time, no attempt is made to quantify expected costs of water and sanitation infrastructure. (We did not add an attempt to quantify expected costs of water and sanitation interventions, as we found highly variable estimates based on different types of interventions and thought it would not serve this study. We did include the cost of a proposed

intervention in this specific slum.)

Reviewer: Richard Rheingans
Associate Professor
University of Florida, USA

I have no competing interests

Overall, I think this is a very useful study. However the non-standard definitions and presentation, and over reaching conclusions take away from this. I think these can be addressed, leading to a strong paper. (Agree and corrected according to almost all suggestions)

Minor comments

P3, line 40, 46. The word haphazard sounds subjective. That isn't necessarily a problem, but may take away from the paper. The system is later referred to elaborate and complex, which seem more fitting. (Done)

P4; first paragraph. Some repetition with above - # residents, summertime shortages. (Fixed)

P4; line 23-4. I agree, but a citation would help. (This seems to us a very general statement to provide a citation for and thus let it stand now as an accepted fact in public health but can provide a citation if Professor Rheingans feels strongly.)

P4; line 27. Referencing 19 studies for this point seems excessive unless there is a need to discuss them in more detail. (Fixed) Some of the citations are repeated (13 and 16). (Fixed) Diarrhea does not need to be capitalized. (Fixed)

P4; line 34. These 19 studies don't directly support this claim. I think the statement is true, but a few well chosen studies focused on the causal relationship between water quantity and quality on diarrhea would be more convincing. (Fixed)

P4; line 34-49. This paragraph is a bit wide ranging. The references 32-34 which are used to explain the impact of water access on long-term earnings do not support that. Two of the studies are on helminth infections. Although these are related to poor sanitation, they are not related to water access. The third is a summary paper with out direct empirical evidence of its own. The combination of global estimates and local survey results is distracting. (Fixed and simplified)

P4; line 56-7. This is a generalization that is not always true. It all depends on the cost and effectiveness of the intervention. Nevertheless, the point is important. High household costs may be an important opportunity to offset the costs of preventive interventions, making them more cost-effective and (perhaps more importantly) more affordable to households. This is an important point because it is central to the significance of the paper (the cost recovery angle). (Fixed)

P5; line 3-8. The connection between diarrheal costs and potential offsets for water and sanitation interventions is important, but a bit oversimplified. Not all diarrheal costs are related to water and sanitation (notably rotavirus or foodborne pathogens). Also, water and sanitation interventions do not necessarily eliminate all water borne pathogens. Hopefully this is addressed further below. (Fixed)

P5; line 21-3. The use of community members as researchers has important advantages and disadvantage. Advantages include unexpected insights and higher likelihood that survey questions capture what the researchers intend. Potential disadvantages include increased yea-saying from

respondents or leading questions. Given that this is fairly innovative in health research, it would be helpful if the authors could mention some of the advantages and disadvantages and how problems were avoided. This isn't essential, but could be a benefit to others. (Done)

P5; line 31-41. The relationship between the baseline and longitudinal is a bit unclear. Is there an overlap between them? Was different data collected? (Fixed)

P5; line 43-5. Additional costs for water and toilet use should be labeled as avoidance costs. These are direct costs, but not direct medical. These are important but should be reported separate from medical costs. (Fixed)

P6; line 11-13. Eliminating the outliers may reduce their influence, but it also excludes the more 'catastrophic' events that might push a family over the edge. It also likely underestimates the mean. Reporting the median or distribution might help, otherwise it may be worth mentioning. (Explained better in methods)

P6; line 38. Are the 400 households in the longitudinal survey the only ones who had events? Were there any repeat households with more than one event? (Answered and explained in results)

P6; all. It is sometimes hard to tell what is coming from the baseline and what is coming from the longitudinal data. Please try to clarify. (Clarified)

P7; line12. Unclear how the median can range from 300-450. Is this the variation between weeks? (This was a function of the survey instrument. The survey asked respondents to choose among a categorical set of options for the question "how much spent on water" with options amongst several ranges and one option was the 300-450 rupee range. We did not collect a continuous response for this question.)

P7; line 17-9. This interpretation probably belongs in the discussion. (Removed)

P7; line 22-4. Direct medical costs and non-medical direct costs should be clearly labeled. Transport to providers is typically considered non-medical direct. (Although transport to providers is typically a non-medical cost, we decided to keep the transport cost in with the direct medical costs because we thought it still made more sense here. Healthcare access is a big factor in health disparities for urban slum communities and we felt the transport cost to a provider should be combined with the medical costs for this study. We did clear up the terminology as per Professor Rheingans' recommendations.)

P7; line 27. How was the cost of household chores not completed calculated? This opportunity cost is very problematic. Some studies have shown that these activities are not forgone, but rather delayed. If a market wage rate was used, this should be explained and justified. The costing of non-wage labor and chores needs to be explained and justified. (Explained and clarified in methods)

P7; line 33. Is this just wages or all indirect costs as calculated. (Clarified)

P7; line 30-6. The mixture of reported direct and indirect costs together in this paragraph is a bit confusing. (Fixed and separated)

P7; line 37-47. This is helpful but seems to belong in the methods. It is always challenging to estimate these opportunity costs, but great care needs to be used in estimating and interpreting them. First, there needs to be some assurance that these activities were actually forgone, not just delayed a few days or done in the evening (in lieu of sleep or leisure). This depends on how the question was asked.

If it was forgone, then what was lost was a service (having a clean floor, etc), not a wage. The question is then how much these households would pay someone to complete that task (i.e., the value to them), not how much they would charge to do the task for someone else. The point is there are substantial uncertainties about the estimates of these costs. It is fine to present them, but they should be reported separately from other indirect costs that actually reflect forgone wages and income. (Done. Explained and clarified in methods)

P7; line 49-50. The distinction between 'basic direct cost' and 'other direct cost' is not standard within the health economics literature. I would suggest using standard definitions such as direct medical, direct non-medical, and direct avoidance costs. (Clarified)

P8; line 13+. Suggest combining table 1 and 2. Suggest more complete titles. Suggest dividing out medical and non-medical expenditures in 'Basic direct costs'. (Combined and clarified but didn't change the titles much. Explained why basic direct costs was not divided above.)

P9; line 5-11. This is a big leap. Although the costs of illness are high compared to income, what portion could be eliminated with improved water and sanitation? What is the cost of improved infrastructure? The average weekly cost per household is much lower than the cost per episode. The introduction makes the argument that user fees for the inefficient water delivery in this community are higher than those in communities with improved water supply. It is likely that user fees for water could easily pay for improved systems, if they were offered. The weekly avoidable diarrheal costs provide an additional potential offset for cost recovery, but it is unclear how that compares. (Tamed this statement and similar claims throughout the paper)

P9; line 16. It would be helpful to explain by what standard is this cost 'high', perhaps by comparing it to income. (Done)

P9; line 22. "...upfront investment in infrastructure is cost-effective." This isn't using the term cost-effective in a standard way. I don't think the authors develop or justify this conclusion. (Agree, removed)

P9; line 46. This is a completely inappropriate citation. It is on rotavirus (not water-borne). There are a few recognized high quality meta-analyses (e.g. Fewtrell and Colford) that should be cited. 63% reduction is out of line with the published evidence. (Fixed from Fewtrell and Colford, thank you for the reference)

P9; line 46-50. Confusing. (Clarified)

P10; line 6-10. The indirect estimates of non-wage time loss is almost certainly an over estimate for this community, not an underestimate. In communities with higher wages or high women's income, the opportunity cost of labor would be greater, but they may also be more likely to have better water and sanitation infrastructure.

P10; line 19. Again, citation 38 is not appropriate in that it is referring to a diarrheal pathogen that is not considered preventable with water and sanitation improvements. (Although estimates of non-wage time would likely be an overestimate we still believe the estimate of income loss is an underestimate given the extremely low employment level in this community. We attempted to make this more clear in the manuscript and look forward to your response.)

P10; line 30. What is the support for community taps providing 25% reduction. Meta-analyses of WASH interventions do not support this. (Removed but similar reduction seen from improved water supply in Fewtrell and Colford meta-analyses)

P10; line 45-6. I don't see how the study shows the feasibility of such programs. (Removed claim)